FIG. 1A

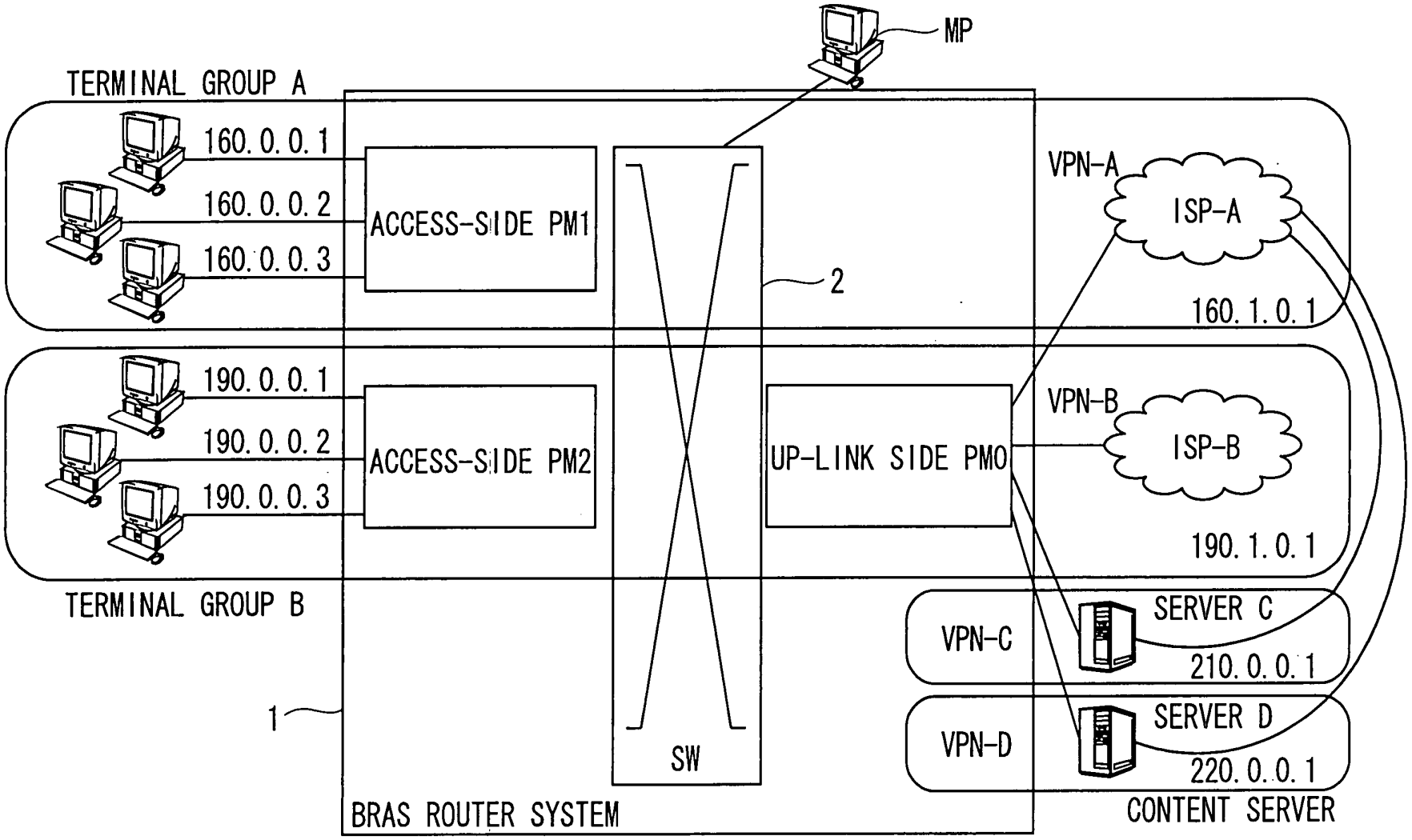
MP
TERMINAL GROUP A
160.0.0.1
160.0.0.2
160.0.0.3
ACCESS-SIDE PM1
2
VPN-A
ISP-A
160.1.0.1
190.0.0.1
190.0.0.2
190.0.0.3
ACCESS-SIDE PM2
UP-LINK SIDE PM0
VPN-B
ISP-B
190.1.0.1
TERMINAL GROUP B
VPN-C
SERVER C
210.0.0.1
VPN-D
SERVER D
220.0.0.1
1
SW
BRAS ROUTER SYSTEM
CONTENT SERVER

FIG. 1B

ROUTING ENTRIES (NETWORK ADDRESS)

CAM ENTRY INFORMATION		SRAM ASSOCIATIVE DATA INFORMATION			REMARKS
VPN	ADDRESS	BLADE NUMBER	PORT	TRANSMITTING -SIDE VPN	
A	160.0.0.0	SWB1	1	A	ISP.A→ TERMINAL GROUP A
C	160.0.0.0	SWB1	1	A	SERVER C→ TERMINAL GROUP A
D	160.0.0.0	SWB1	1	A	SERVER D→ TERMINAL GROUP A
B	190.0.0.0	SWB2	1	B	ISP.B→ TERMINAL GROUP B
C	190.0.0.0	SWB2	1	B	SERVER C→ TERMINAL GROUP B
D	190.0.0.0	SWB2	1	B	SERVER D→ TERMINAL GROUP B
A	160.1.0.0	SWB0	1	A	TERMINAL GROUP A→ ISP.A
B	190.1.0.0	SWB0	2	B	TERMINAL GROUP B→ ISP.B
A	210.0.0.0	SWB0	3	C	TERMINAL GROUP A→ SERVER C
B	210.0.0.0	SWB0	3	C	TERMINAL GROUP B→ SERVER C
C	210.0.0.0	SWB0	3	C	TERMINAL GROUPS A,B→SERVER C
A	220.0.0.0	SWB0	4	D	TERMINAL GROUP A→ SERVER D
B	220.0.0.0	SWB0	4	D	TERMINAL GROUP B→ SERVER D
D	220.0.0.0	SWB0	4	D	TERMINAL GROUPS A,B→SERVER D

ROUTING ENTRY (FOR TERMINAL)

CAM ENTRY INFORMATION		SRAM ASSOCIATIVE DATA INFORMATION		
VPN	ADDRESS	BLADE NUMBER	PORT	TRANSMITTING-SIDE VPN
A	160.0.0.1	SWB1	1	A
A	160.0.0.2	SWB1	1	A
A	160.0.0.3	SWB1	1	A
B	160.0.0.1	SWB1	1	A
B	160.0.0.2	SWB1	1	A
B	160.0.0.3	SWB1	1	A
C	160.0.0.1	SWB1	1	A
C	160.0.0.2	SWB1	1	A
C	160.0.0.3	SWB1	1	A
D	160.0.0.1	SWB1	1	A
D	160.0.0.2	SWB1	1	A
D	160.0.0.3	SWB1	1	A
A	190.0.0.1	SWB2	1	B
A	190.0.0.2	SWB2	1	B
A	190.0.0.3	SWB2	1	B
B	190.0.0.1	SWB2	1	B
B	190.0.0.2	SWB2	1	B
B	190.0.0.3	SWB2	1	B
C	190.0.0.1	SWB2	1	B
C	190.0.0.2	SWB2	1	B
C	190.0.0.3	SWB2	1	B
D	190.0.0.1	SWB2	1	B
D	190.0.0.2	SWB2	1	B
D	190.0.0.3	SWB2	1	B

FIG. 2

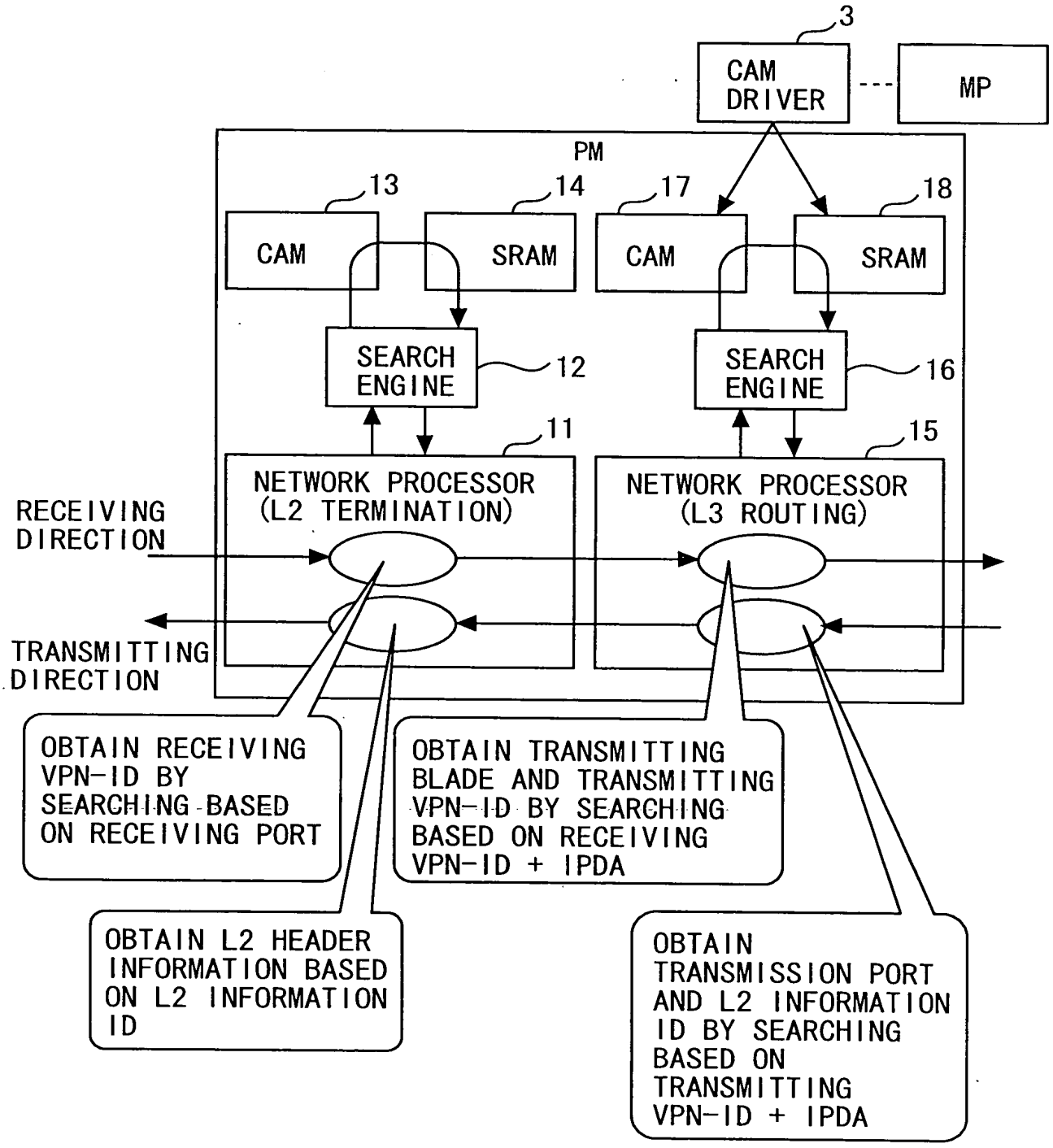
3
CAM DRIVER
MP
PM
13
14
17
18
CAM
SRAM
CAM
SRAM
SEARCH ENGINE
12
SEARCH ENGINE
16
11
15
NETWORK PROCESSOR (L2 TERMINATION)
NETWORK PROCESSOR (L3 ROUTING)
RECEIVING DIRECTION
TRANSMITTING DIRECTION
OBTAIN RECEIVING VPN-ID BY SEARCHING BASED ON RECEIVING PORT
OBTAIN TRANSMITTING BLADE AND TRANSMITTING VPN-ID BY SEARCHING BASED ON RECEIVING VPN-ID + IPDA
OBTAIN L2 HEADER INFORMATION BASED ON L2 INFORMATION ID
OBTAIN TRANSMISSION PORT AND L2 INFORMATION ID BY SEARCHING BASED ON TRANSMITTING VPN-ID + IPDA

FIG. 3A

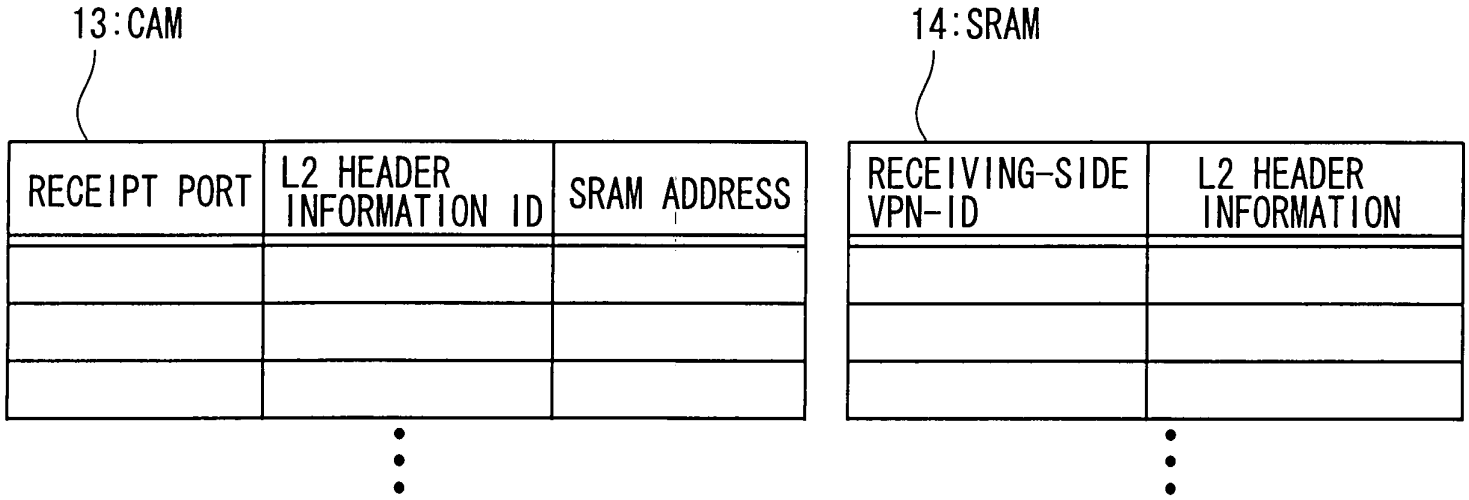
13:CAM
14:SRAM
RECEIPT PORT
L2 HEADER INFORMATION ID
SRAM ADDRESS
RECEIVING-SIDE VPN-ID
L2 HEADER INFORMATION

FIG. 3B

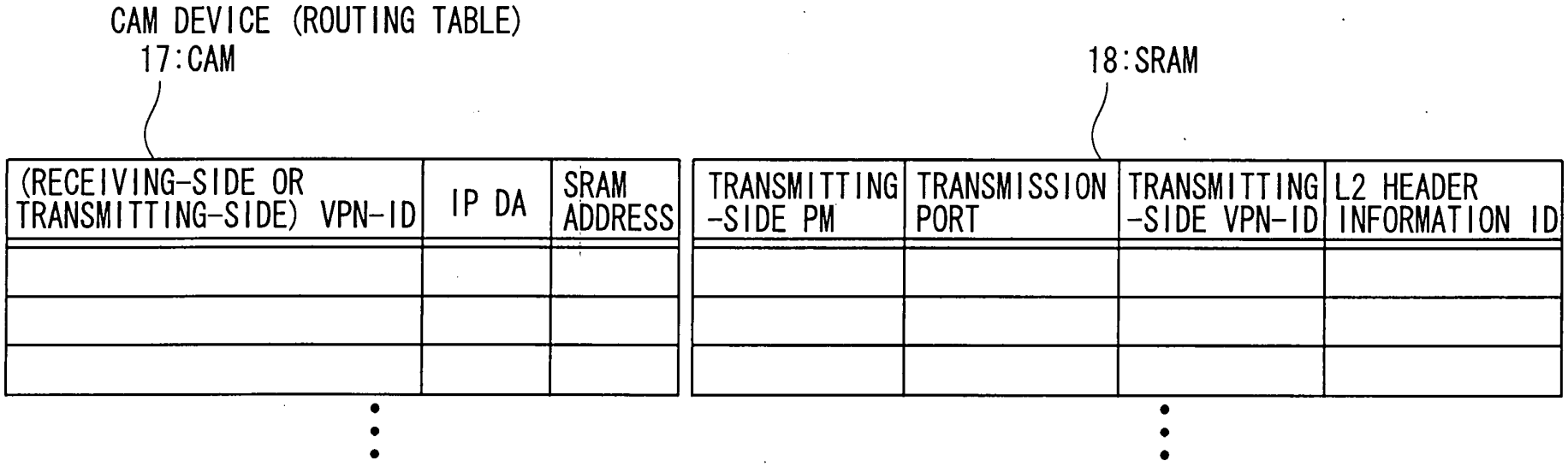
CAM DEVICE (ROUTING TABLE)
17:CAM
18:SRAM
(RECEIVING-SIDE OR TRANSMITTING-SIDE) VPN-ID
IP DA
SRAM ADDRESS
TRANSMITTING-SIDE PM
TRANSMISSION PORT
TRANSMITTING-SIDE VPN-ID
L2 HEADER INFORMATION ID

FIG. 4

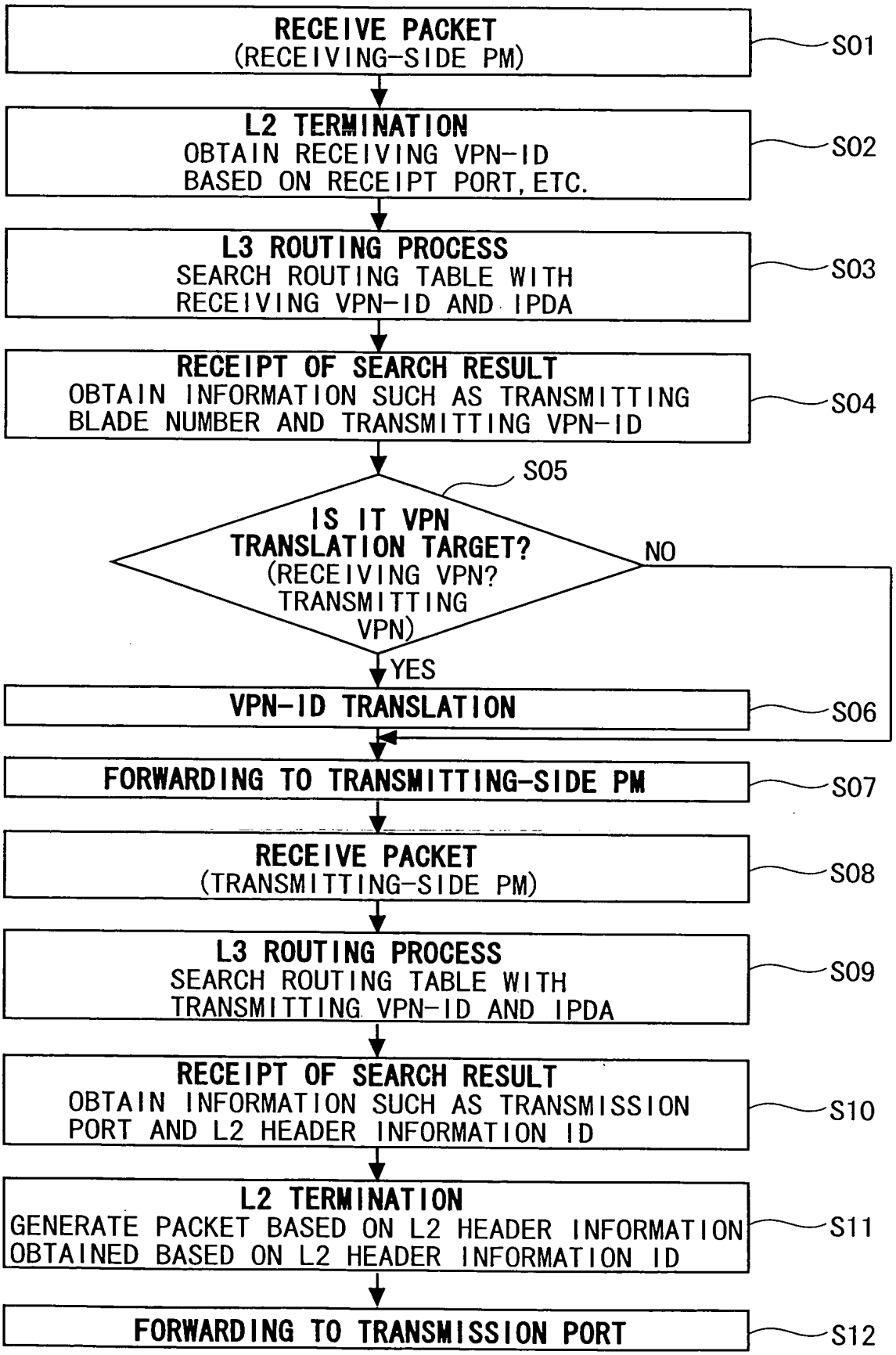
RECEIVE PACKET
(RECEIVING-SIDE PM)
S01
L2 TERMINATION
OBTAIN RECEIVING VPN-ID
BASED ON RECEIPT PORT, ETC.
S02
L3 ROUTING PROCESS
SEARCH ROUTING TABLE WITH
RECEIVING VPN-ID AND IPDA
S03
RECEIPT OF SEARCH RESULT
OBTAIN INFORMATION SUCH AS TRANSMITTING
BLADE NUMBER AND TRANSMITTING VPN-ID
S04
S05
IS IT VPN
TRANSLATION TARGET?
(RECEIVING VPN?
TRANSMITTING
VPN)
NO
YES
VPN-ID TRANSLATION
S06
FORWARDING TO TRANSMITTING-SIDE PM
S07
RECEIVE PACKET
(TRANSMITTING-SIDE PM)
S08
L3 ROUTING PROCESS
SEARCH ROUTING TABLE WITH
TRANSMITTING VPN-ID AND IPDA
S09
RECEIPT OF SEARCH RESULT
OBTAIN INFORMATION SUCH AS TRANSMISSION
PORT AND L2 HEADER INFORMATION ID
S10
L2 TERMINATION
GENERATE PACKET BASED ON L2 HEADER INFORMATION
OBTAINED BASED ON L2 HEADER INFORMATION ID
S11
FORWARDING TO TRANSMISSION PORT
S12

FIG. 5

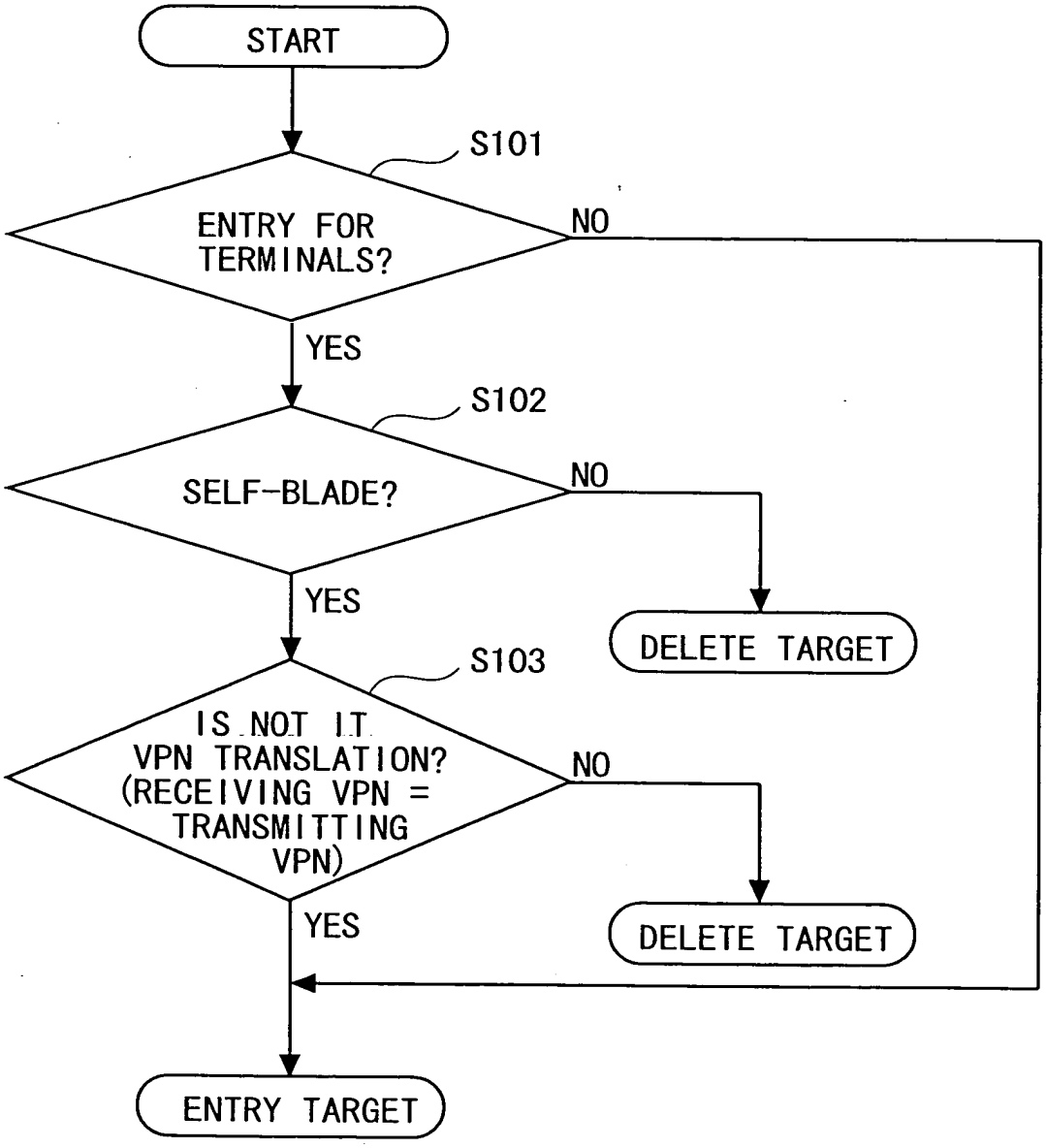
START
S101
ENTRY FOR TERMINALS?
NO
YES
S102
SELF-BLADE?
NO
YES
DELETE TARGET
S103
IS NOT IT VPN TRANSLATION? (RECEIVING VPN = TRANSMITTING VPN)
NO
YES
DELETE TARGET
ENTRY TARGET

FIG. 6A

ROUTING ENTERIES (FOR TERMINAL)

CAM ENTRY INFORMATION		SRAM ASSOCIATIVE DATA INFORMATION		
VPN	ADDRESS	BLADE NUMBER	PORT	TRANSMITTING-SIDE VPN
A	160.0.0.1	SWB1	1	A
A	160.0.0.2	SWB1	1	A
A	160.0.0.3	SWB1	1	A
B	160.0.0.1	SWB1	1	A
B	160.0.0.2	SWB1	1	A
B	160.0.0.3	SWB1	1	A
C	160.0.0.1	SWB1	1	A
C	160.0.0.2	SWB1	1	A
C	160.0.0.3	SWB1	1	A
D	160.0.0.1	SWB1	1	A
D	160.0.0.2	SWB1	1	A
D	160.0.0.3	SWB1	1	A
A	190.0.0.1	SWB2	1	B
A	190.0.0.2	SWB2	1	B
A	190.0.0.3	SWB2	1	B
B	190.0.0.1	SWB2	1	B
B	190.0.0.2	SWB2	1	B
B	190.0.0.3	SWB2	1	B
C	190.0.0.1	SWB2	1	B
C	190.0.0.2	SWB2	1	B
C	190.0.0.3	SWB2	1	B
D	190.0.0.1	SWB2	1	B
D	190.0.0.2	SWB2	1	B
D	190.0.0.3	SWB2	1	B

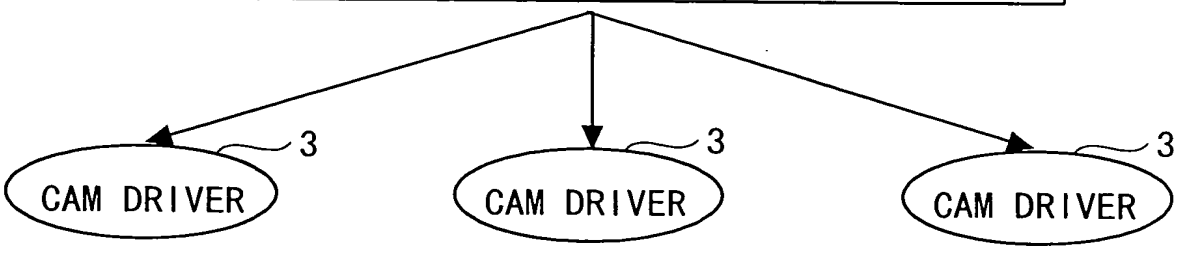

FIG. 6B

EACH CAM DRIVER DELETES ENTRIES OF SELF-BLADE NUMBER AND RECEIVING-SIDE VPN-ID ? TRANSMITTING-SIDE VPN ID, OTHER THAN SELF-BLADE

3 CAM DRIVER

ROUTING ENTRY (FOR TERMINAL)

CAM ENTRY INFORMATION		SRAM ASSOCIATIVE DATA INFORMATION		
VPN	ADDRESS	BLADE NUMBER	PORT	TRANSMITTING-SIDE VPN
A	160.0.0.1	SWB1	1	A
A	160.0.0.2	SWB1	1	A
A	160.0.0.3	SWB1	1	A
B	160.0.0.1	SWB1	1	A
B	160.0.0.2	SWB1	1	A
B	160.0.0.3	SWB1	1	A
C	160.0.0.1	SWB1	1	A
C	160.0.0.2	SWB1	1	A
C	160.0.0.3	SWB1	1	A
D	160.0.0.1	SWB1	1	A
D	160.0.0.2	SWB1	1	A
D	160.0.0.3	SWB1	1	A
A	190.0.0.1	SWB2	1	B
A	190.0.0.2	SWB2	1	B
A	190.0.0.3	SWB2	1	B
B	190.0.0.1	SWB2	1	B
B	190.0.0.2	SWB2	1	B
B	190.0.0.3	SWB2	1	B
C	190.0.0.1	SWB2	1	B
C	190.0.0.2	SWB2	1	B
C	190.0.0.3	SWB2	1	B
D	190.0.0.1	SWB2	1	B
D	190.0.0.2	SWB2	1	B
D	190.0.0.3	SWB2	1	B

3 CAM DRIVER

ROUTING ENTRY (FOR TERMINAL)

CAM ENTRY INFORMATION		SRAM ASSOCIATIVE DATA INFORMATION		
VPN	ADDRESS	BLADE NUMBER	PORT	TRANSMITTING-SIDE VPN
A	160.0.0.1	SWB1	1	A
A	160.0.0.2	SWB1	1	A
A	160.0.0.3	SWB1	1	A
B	160.0.0.1	SWB1	1	A
B	160.0.0.2	SWB1	1	A
B	160.0.0.3	SWB1	1	A
C	160.0.0.1	SWB1	1	A
C	160.0.0.2	SWB1	1	A
C	160.0.0.3	SWB1	1	A
D	160.0.0.1	SWB1	1	A
D	160.0.0.2	SWB1	1	A
D	160.0.0.3	SWB1	1	A
A	190.0.0.1	SWB2	1	B
A	190.0.0.2	SWB2	1	B
A	190.0.0.3	SWB2	1	B
B	190.0.0.1	SWB2	1	B
B	190.0.0.2	SWB2	1	B
B	190.0.0.3	SWB2	1	B
C	190.0.0.1	SWB2	1	B
C	190.0.0.2	SWB2	1	B
C	190.0.0.3	SWB2	1	B
D	190.0.0.1	SWB2	1	B
D	190.0.0.2	SWB2	1	B
D	190.0.0.3	SWB2	1	B

3 CAM DRIVER

ROUTING ENTRY (FOR TERMINAL)

CAM ENTRY INFORMATION		SRAM ASSOCIATIVE DATA INFORMATION		
VPN	ADDRESS	BLADE NUMBER	PORT	TRANSMITTING-SIDE VPN
A	160.0.0.1	SWB1	1	A
A	160.0.0.2	SWB1	1	A
A	160.0.0.3	SWB1	1	A
B	160.0.0.1	SWB1	1	A
B	160.0.0.2	SWB1	1	A
B	160.0.0.3	SWB1	1	A
C	160.0.0.1	SWB1	1	A
C	160.0.0.2	SWB1	1	A
C	160.0.0.3	SWB1	1	A
D	160.0.0.1	SWB1	1	A
D	160.0.0.2	SWB1	1	A
D	160.0.0.3	SWB1	1	A
A	190.0.0.1	SWB2	1	B
A	190.0.0.2	SWB2	1	B
A	190.0.0.3	SWB2	1	B
B	190.0.0.1	SWB2	1	B
B	190.0.0.2	SWB2	1	B
B	190.0.0.3	SWB2	1	B
C	190.0.0.1	SWB2	1	B
C	190.0.0.2	SWB2	1	B
C	190.0.0.3	SWB2	1	B
D	190.0.0.1	SWB2	1	B
D	190.0.0.2	SWB2	1	B
D	190.0.0.3	SWB2	1	B

FIG. 7A PRIOR ART

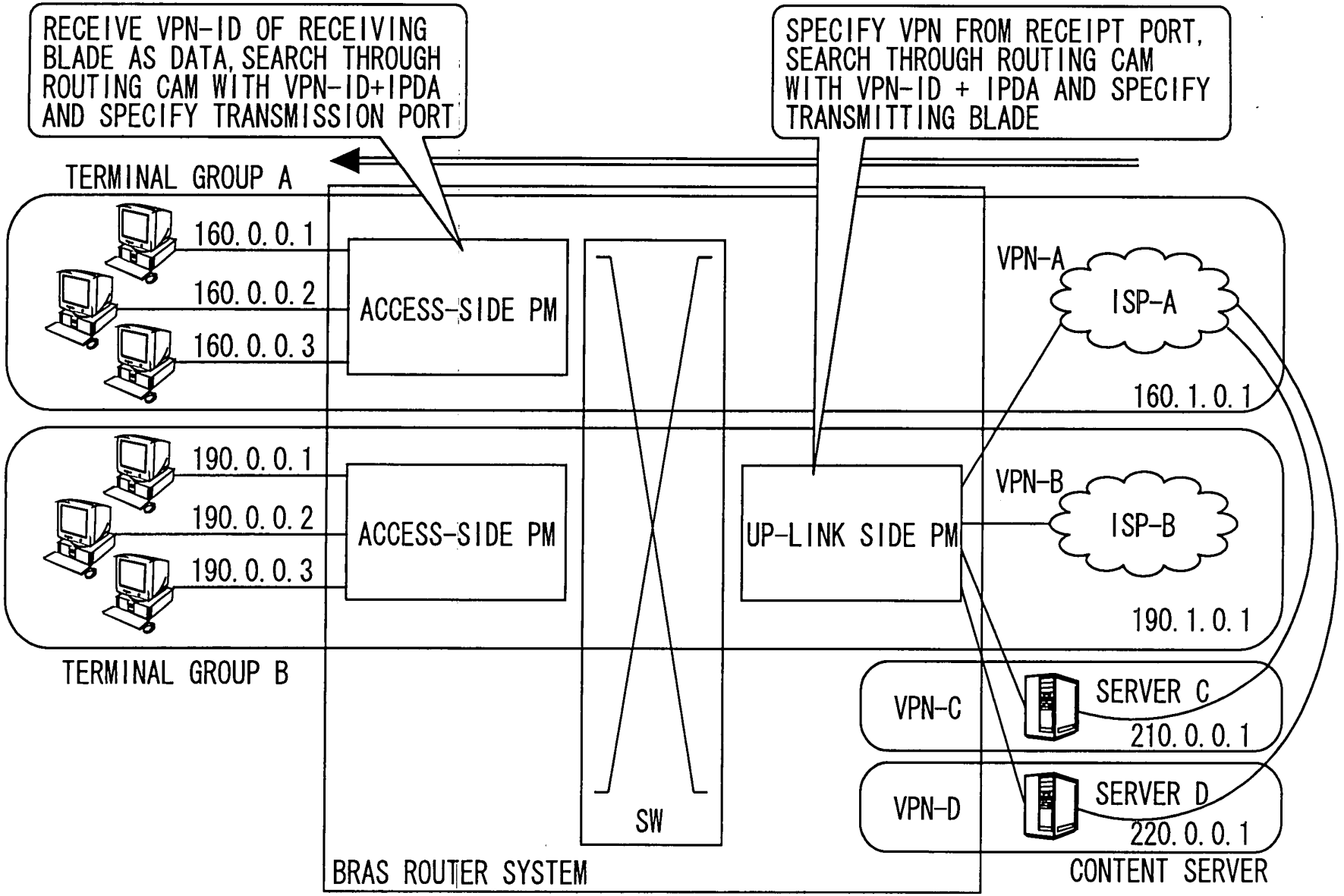

FIG. 7B PRIOR ART

ROUTING ENTRIES (NETWORK ADDRESS)

VPN	ADDRESS	PREFIX	REMARKS
A	160.0.0.0	24	ISP.A→ TERMINAL GROUP A
C	160.0.0.0	24	SERVER C→ TERMINAL GROUP A
D	160.0.0.0	24	SERVER D→ TERMINAL GROUP A
B	190.0.0.0	24	ISP.B→ TERMINAL GROUP B
C	190.0.0.0	24	SERVER C→ TERMINAL GROUP B
D	190.0.0.0	24	SERVER D→ TERMINAL GROUP B
A	160.1.0.0	24	TERMINAL GROUP A→ ISP.A
B	190.1.0.0	24	TERMINAL GROUP B→ ISP.B
A	210.0.0.0	24	TERMINAL GROUP A→ SERVER C
B	210.0.0.0	24	TERMINAL GROUP B→ SERVER C
C	210.0.0.0	24	TERMINAL GROUPS A,B→SERVER C
A	220.0.0.0	24	TERMINAL GROUP A→ SERVER D
B	220.0.0.0	24	TERMINAL GROUP B→ SERVER D
D	220.0.0.0	24	TERMINAL GROUPS A,B? SERVER D

MULTIPLICITY OF OVERLAPPED ENTRIES FOR TERMINALS

FIG. 7C PRIOR ART

ROUTING ENTRY (FOR TERMINAL)

VPN	ADDRESS	PREFIX	REMARKS
A	160.0.0.1	32	
A	160.0.0.2	32	
A	160.0.0.3	32	
B	160.0.0.1	32	OVERLAPPED SETTING
B	160.0.0.2	32	OVERLAPPED SETTING
B	160.0.0.3	32	OVERLAPPED SETTING
C	160.0.0.1	32	OVERLAPPED SETTING
C	160.0.0.2	32	OVERLAPPED SETTING
C	160.0.0.3	32	OVERLAPPED SETTING
D	160.0.0.1	32	OVERLAPPED SETTING
D	160.0.0.2	32	OVERLAPPED SETTING
D	160.0.0.3	32	OVERLAPPED SETTING
A	190.0.0.1	32	OVERLAPPED SETTING
A	190.0.0.2	32	OVERLAPPED SETTING
A	190.0.0.3	32	OVERLAPPED SETTING
B	190.0.0.1	32	
B	190.0.0.2	32	
B	190.0.0.3	32	
C	190.0.0.1	32	OVERLAPPED SETTING
C	190.0.0.2	32	OVERLAPPED SETTING
C	190.0.0.3	32	OVERLAPPED SETTING
D	190.0.0.1	32	OVERLAPPED SETTING
D	190.0.0.2	32	OVERLAPPED SETTING
D	190.0.0.3	32	OVERLAPPED SETTING